Executive Summary

2006 Vision

By 2006, the Environmental Management program intends to complete cleanup at most of its 53 remaining sites. At a small number of sites, treatment will continue for the few remaining "legacy" waste streams. This vision will drive budget decisions, the sequencing of projects, and the actions needed to meet program objectives. This vision will be implemented in collaboration with stakeholders, regulators, and Tribal Nations.

The Challenge

Cleanup of the radioactive, chemical, and other hazardous waste left after 50 years of U.S. production of nuclear weapons is the largest environmental management program in the world. Only in the last five years has the Department of Energy (DOE) made substantial progress in systematically defining the technical scope, schedules, and life-cycle costs of meeting this challenge, and creating a step-by-step work plan to tackle it.

The Department of Energy, its stakeholders, its regulators, Tribal Nations, the Congress, and the American people want to accelerate and finish the job of cleaning up DOE's sites. At the same time, we all continue to share the goal of placing the safety of our workers, our communities, and the environment first among all other priorities.

Accelerating Cleanup: Paths to Closure provides, for the first time, a project-by-project projection of the technical scope, cost, and schedule required to complete all 353 projects at DOE's 53 remaining cleanup sites in the United States. These projections are essential for better management—they provide critical information on technical activities, budgets, worker health and safety, and risk to inform regulators, state and local officials, stakeholders, Tribal Nations, and others. With DOE, all these groups need a comprehensive understanding of the technical requirements for meeting DOE's obligations and agreements. We can then work together to clean up as many sites as possible, as quickly and safely as possible. Our goal is to clean up more than 90 percent of our sites by 2006. It is important to note that the "closure" of a site does not end DOE's responsibility. In most cases DOE will continue long-term surveillance and monitoring activities to ensure that human health and the environment are protected.

Resources are limited; technical risks are often high, and schedules for meeting compliance agreements are often very ambitious. For the first time, we—DOE officials, stakeholders, regulators, Tribal Nations, and the Congress—have a comprehensive management tool that can inform us of the consequences of our choices. *Paths to Closure* provides:

- An integrated path forward for the management of the Environmental Management (EM) complex, based on a project-by-project, life-cycle foundation;
- A basis to evaluate EM's annual budgets in the context of long-term cleanup and closure requirements and projections;
- A response to Congressional requests for a supportable management strategy on the EM program; and
- A response to the concerns of stakeholders, regulators, and Tribal Nations.

Paths to Closure reflects the most recent evolution of DOE's ability to accurately project the cost, schedule and scope of its massive cleanup effort. These efforts began in earnest with the first Baseline Environmental Management Report (BEMR), issued in 1995. This was the first, systematic effort to document the scope and life-cycle costs of the cleanup program, as well as the first effort to engage the public in constructive debate about the future of the nation's former nuclear weapons sites and facilities. The second BEMR, issued in 1996, lowered overall cost estimates to a range of $189 billion to $265 billion, from the previous estimate of $206 billion to $360 billion. The lower projections were largely due to applying less costly but effective environmental solutions as well as improved data on waste volumes.

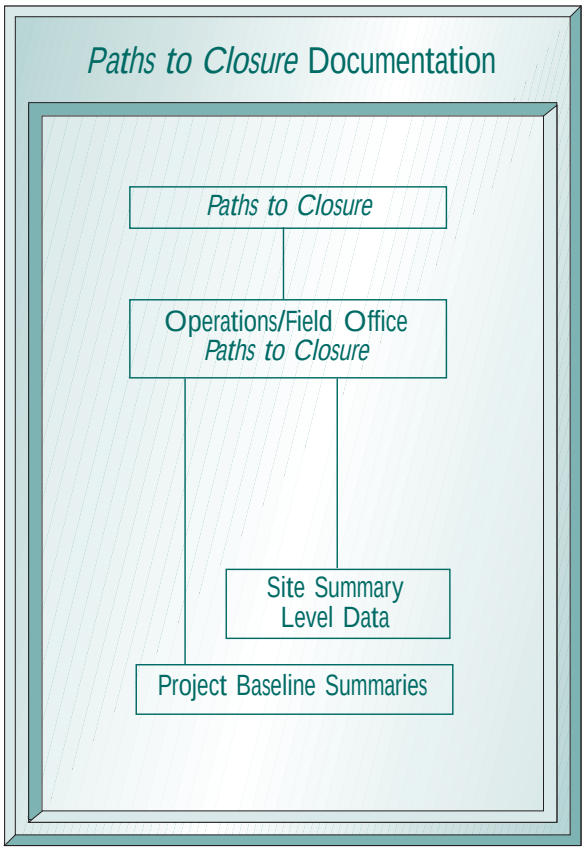
Reduction in EM Life-cycle Cleanup Cost Estimates

Since publication of the last life-cycle cost estimate for the EM cleanup program in the 1996 *Baseline Environmental Management Report* the life-cycle cleanup cost estimate has decreased by over $40 billion, when the analyses are adjusted to be comparable. A variety of factors contribute to this decrease:

- Completed cleanup work;
- Reduced overhead and support costs;
- Re-sequenced activities; and
- Improved cross-site integration.

The discussion draft of *Accelerating Cleanup: Focus on 2006 Plan* followed up on these efforts. The report was designed to accelerate cleanup, and reduce overall costs while maintaining the Department's commitment to meet federal and state regulations and compliance agreements. That report, issued in June 1997, evolved into the current draft report, *Accelerating Cleanup: Paths to Closure. Paths to Closure* is a critical management tool that provides project-by-project work plans of each of 353 projects at DOE cleanup sites nationwide. Compared to the original BEMR, it is a more detailed, project-driven approach that uses locally determined "end-states" (defined below). *Paths to Closure* is part of a continuum from the first life-cycle cost estimates and risk analyses underlying the BEMR that initiated the first national dialogue on these issues. Current life-cycle estimates for cleanup, based on the assumptions described in this report, total $147 billion (see box).

Paths to Closure reflects DOE's strengthened and more organized commitment to listen and respond to stakeholder, regulator, Tribal Nation, and internal DOE concerns. The result is a more realistic projection of where we are headed, how we can accelerate cleanup and closure, and what the technical, policy, and other barriers are to the further acceleration of those goals. This draft incorporates extensive comments and guidance received from stakeholders, regulators, and Tribal Nations on the first draft circulated in June 1997. It is, however, still a draft, and it will continue to benefit from the input and guidance we receive from everyone concerned. *Paths to Closure* will be released this summer as a "final" document and then will be revised annually to reflect new technical, budgetary, and other opportunities and challenges.



Chapter 1 describes in more detail the process by which *Paths to Closure* has been developed and what it hopes to accomplish, along with a general background of the Environmental Management mission and program. Chapter 2, "Baseline Scope, Schedule, and Cost," describes how the site-by-site projections were constructed, and summarizes, for each of DOE's 11 field offices, the projected costs and schedules for completing the cleanup mission. Chapter 3 presents summaries of the detailed cleanup projections from three of the 11 field offices: Rocky Flats (Colorado), Richland (Washington), and Savannah River (South Carolina). (The remaining eight field office summaries are in Appendix E.) These summaries are built on the projections for the individual projects and sites that these field offices oversee (see box.)

Chapter 4, "Meeting Programmatic Challenges," reviews the cost drivers, budgetary constraints, and "performance enhancements" underlying the detailed analysis of the 353 projects that comprise EM's accelerated cleanup and closure effort. Chapter 5 describes "A Management System To Support the EM Program." Chapter 6 discusses the involvement of stakeholders, regulators, and Tribal Nations in the development, review and revision of this document and the execution of the cleanup and closure program.

Projected Scope, Schedule, and Cost

Paths to Closure contains the Environmental Management program's detailed projections on the scope, schedules, and costs for the cleanup of contaminated soil, groundwater, and facilities; treating, storing, and disposing of waste; and effectively managing nuclear materials and spent nuclear fuel. These projections identify, where possible, future decisions that must be made and define the degree of technical and scope uncertainties.

A key component of *Paths to Closure* is the development of projections—or "baselines" (as estimates of individual projects are called). The projections include descriptions of the work to be accomplished, schedules (including interim milestones), and cost estimates for each project. Chapter 2 of this report provides summary information on the scope, schedule, and cost of the Environmental Management program, as derived from these baselines. The division of all cleanup work into projects and the establishment of formal projections, or baselines, represents a significant shift in DOE's approach to environmental management. The process of establishing specific projects and baselines with defined scope, schedule, and cost projections has resulted in significant reductions in EM life-cycle cost estimates since the initiation of the 2006 planning process in 1996.

Developing cost, schedule, and scope projections also requires defining a cleanup "end state" for each site. The cleanup of a site is considered to be complete—to have reached its end state—when it has been cleaned up in accordance with agreed-upon cleanup standards. (Additional elements of this definition are provided in Chapter 1.) To develop a cost, schedule, and scope projection for a project, some assumptions have been made about the desired end state. The projections made for this document include end states that are consistent with existing agreements and applicable regulations, and make (locally discussed) assumptions for the many sites still in the process of working with stakeholders, regulators, and Tribal Nations to finalize agreed-upon end states. Many end states will change for a number of reasons, including the development of new technologies, more economical cleanup approaches, and changes in the interests of stakeholders, regulators, and Tribal Nations.

For the first time, every site has a critical closure path, identifying the key technical and programmatic activities that must occur before closing a site. Also for the first time, each site has waste and materials disposition flow charts that describe each waste stream, the steps for processing or managing the wastes, and where the wastes are intended to be permanently disposed (if known). And finally, for the first time, DOE has identified the potential roadblocks on the critical closure path, by identifying technological uncertainty, the degree of intersite dependence, among other factors.

Projections of scope, schedule, and cost contain the data necessary to establish an estimated life-cycle cleanup cost and a completion date for EM work at each site. *Paths to Closure* assumes a "top line" funding level of $5.75 billion per year, starting

in fiscal year 1999,[1] to establish the projections and to demonstrate what can be accomplished with a specific level of funding level over time. No increases are included for future inflation, so in "real" terms (i.e., in terms of constant FY 1998 dollars), the amount of funding decreases every year.

With this assumed funding level, the sum of the life-cycle cost estimates for the current 353 projects is about $147 billion between 1997 and 2070. Of this amount, about $57 billion would be expended through 2006; about $90 billion would be expended from 2007-2070. (The box below provides a summary of these costs, by field office and time frame.) Chapter 3 provides more detailed scope, schedule, and cost information for sites covered by three of DOE's field offices. Appendix E provides information on the remaining eight field offices. The more detailed site versions of *Paths to Closure* provide still further details.

EM Costs by Operations/Field Office

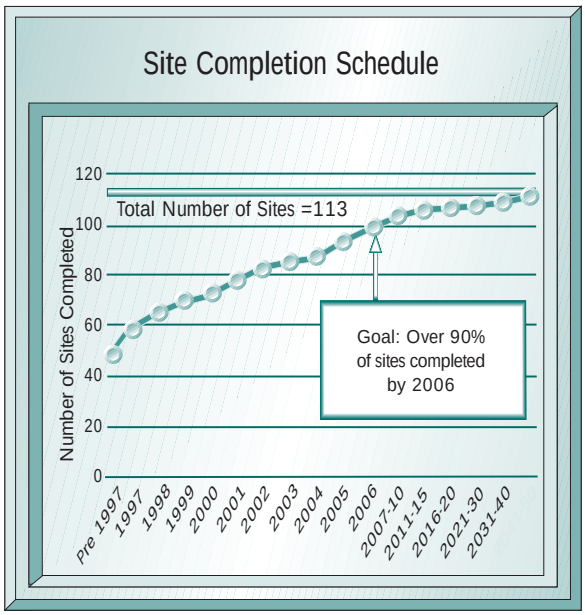
Operations/ Field Office	Estimated EM Costs (1997-2006)	Estimated EM Costs (2007-2070)	Total Estimated EM Costs (1997-2070)	Number of Sites Completed	
	(All costs in billions of constant 1998 dollars)			1998-2006	After 2006
Albuquerque	2.1	2.0	4.1	12	1
Carlsbad	1.8	5.9	7.7	0	1
Chicago	0.3	0.0	0.3	5	0
Headquarters/ National Programs	5.7	5.6	11.3	NA	NA
Idaho	5.0	11.3	16.3	0	1
Nevada	0.9	1.3	2.2	8	2
Oakland	0.7	0.3	1.0	8	1
Oak Ridge	5.4	7.7	13.1	3	2
Ohio	4.6	0.2	4.8	5	1
Richland	13.0	37.3	50.3	0	1
Rocky Flats	5.3	1.0	6.3	0	1
Savannah River	12.0	17.7	29.7	0	1
TOTAL[a]	57.0	90.3	147.3	41[b]	12
				53	

[a]Individual costs may not sum to totals due to rounding.
[b]With the accelerated goal of cleaning up the Rocky Flats Technology Site and the Fernald Environmental Management Project (by 2006 and 2005 respectively), the number of sites completed by 2006 would be 43.

[1]The selection criteria for a planned funding level were reasonableness and stability. The selected level is the midpoint between the two planning level scenarios ($5.5 and $6.0 billion per year) in the June 1997 *Discussion Draft*.

Numerous cleanup activities will continue beyond 2006. Projections reveal that at the Hanford Site in Washington, the Idaho National Engineering and Environmental Laboratory, and the Savannah River Site in South Carolina, about half the costs will be incurred after 2006 for treatment and disposal of high-level and transuranic waste. Although some activities will not be completed by 2006, a primary goal of *Paths to Closure* is to reduce out-year costs. At the end of FY 1997, 60 of the 113 contaminated sites had been cleaned up. An additional 43 sites are estimated to be cleaned up between 1998 and 2006—for a total of 103 cleaned up sites by 2006 (see box). Long-term cleanup activities will continue at the remaining 10 sites. Major cleanup actions expected by 2006 include:

- Remediation of 80 percent of all release sites, that is, specific locations or areas where contaminants may have been released to the environment;
- Stabilization of all nuclear materials and spent nuclear fuel and completion of all preparations for their ultimate disposition; and
- Completion of all cleanup activities at some major sites, for example, the Rocky Flats Environmental Technology Site, the Fernald Environmental Management Project, the Miamisburg Environmental Management Project, and the Weldon Spring Site.



Meeting Programmatic Challenges

To reduce the costs of this massive cleanup effort, the Environmental Management program continues to seek significant opportunities to accelerate cleanup work scope without jeopardizing the safety of workers, communities, or the environment. *Paths to Closure* addresses the need to continuously seek "performance enhancements," i.e., productivity improvements that will allow DOE to accelerate cleanup and closure schedules, and lower overall life-cycle cleanup costs. The EM program is focusing on six specific mechanisms to help achieve additional performance efficiencies (see box).

Accelerating cleanup even further than is projected in *Paths to Closure* will certainly happen, although the degree of acceleration is difficult to predict. For example, the Department and its stakeholders and regulators in Colorado have established an

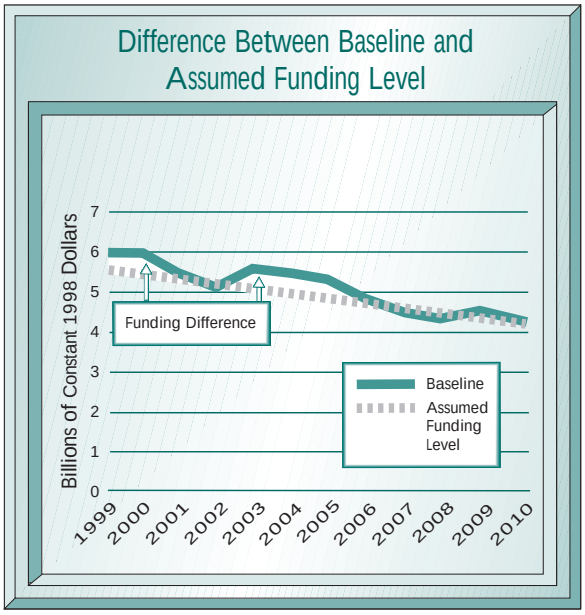
accelerated goal of cleaning up and closing the Rocky Flats Environmental Technology Site by 2006—four years earlier than the current projection indicates. DOE will attempt to set similar acceleration goals at other cleanup sites. Credible acceleration goals will be based on the likelihood of achieving technology deployment, program integration, and other productivity improvements. Chapter 4 of this report discusses enhanced performance mechanisms and goals in greater detail.

Performance Enhancement Mechanisms

Mechanism	Achieves Efficiency By...
Technology Deployment	Introducing less expensive and/or more effective cleanup technologies.
Program Integration	Identifying better ways to transfer and manage wastes among sites.
Project Sequencing	Completing projects with high "upkeep" costs.
Pollution Prevention	Reducing waste volumes and associated disposal costs.
Contract Reform	Creating incentives for contractors to work less expensively.
Lessons Learned	Increasing productivity based on lessons learned.

Although *Paths to Closure* is not a budget document, it is designed to be an integral part of the annual and multi-year DOE budget development process. The projections prepared for each site are the basis upon which future resource allocation decisions and tradeoffs can be made. In building future budgets, differences will emerge between the cost projections established in this and future *Paths to Closure*, and budget allocations to DOE from the President and the Congress. *Paths to Closure* gives EM, its stakeholders, regulators, and Tribal Nations, and the Congress the management tools we need to understand the consequences of our choices—the effects on life-cycle costs and closure date schedules of alternative near-term and out-year budget scenarios.

EM established an assumed funding level for *Paths to Closure* of $5.75 billion per year. This figure was set in October 1997, *prior to DOE receiving its FY 1999 and outyear budget targets from the President.* It was essential to establish a top-line funding profile at that time in order to produce this report on schedule. One critical budget and resource allocation question is how the EM program will make up the difference between the assumed funding level of $5.75 billion, and the requirement for more than that in several future years to meet compliance agreements and other commitments. An even more difficult question is what would happen if the top-line funding assumption of $5.75 billion per year is not met. The chart below converts the $5.75 billion per year in "current" (or "nominal") dollars, to "constant" FY 1998 dollars—thus showing how inflation lowers the "real" amount of money available each year. The higher "baseline" level of funding is that which is required based on



the projections from each of the 353 projects. The gap between the two is $3.5 billion (in constant FY 1998 dollars) between 1999 and 2006.

The first step in meeting this challenge is the aggressive application of the productivity improvements—the performance enhancements—described above and in Chapter 4. The performance enhancements are expected to include improvements in the efficiency of day-to-day operations, the deployment of new technologies, and streamlined approaches—to be developed with regulators—for managing waste and cleaning up contaminated areas.

If performance enhancements are not sufficient to address funding differences at specific sites, and if additional funding requests are not successful, EM would pursue several options. In cases where new work is required immediately to protect safety and health and where related costs exceed available appropriations, the Department will shift funds from lower priority activities to ensure that public health and safety are adequately protected.

In future years where larger funding differences are projected, the Department intends to work with the Office of Management and Budget and the Congress to seek additional funds for vitally important missions. Also, DOE will propose shifting out year funding from completed sites to other sites. No matter how successful these efforts are, however, the discipline of working within binding budget ceilings means that the EM program must engage in an active dialogue with stakeholders, regulators, and Tribal Nations about activities and programs at each of the sites—and collectively make hard choices regarding priorities.

A Management System to Support the EM Program

The Environmental Management program is developing a formal integrated management system to more closely align *Paths to Closure* and the annual budget formulation process. This system will allow the Environmental Management program to use a single framework for all activities linked to planning, the budget formulation and execution process, and performance measurement. For the first time, EM is working toward the implementation of a truly integrated life-cycle database containing all of the relevant data the field provides to headquarters. Chapter 5 of this report describes the EM management system components of the process in greater detail, including some of the new management tools:

- Waste/Material Disposition Maps (or flow charts), which are conceptual approaches to the environmental remediation of contaminated soil, groundwater, and buildings; and for the storage, treatment, and disposal of all waste and material at all sites;
- Critical Closure Paths, which are the schedules of activities that must be completed on time in order for cleanup to be accomplished;
- Identification of Specific Technology Needs, to help reduce the costs of specific projects by developing less expensive cleanup technologies; and
- Programmatic Risk Assessments, which provide a measure of the risks associated with accomplishing the work and meeting schedules and cost estimates.

As the drafts of *Paths to Closure* move forward, the quality of the data on which they are based continues to improve. *Paths to Closure* represents a significant refinement over the national Discussion Draft and the site Discussion Drafts published in June 1997. Project baselines, the heart of *Paths to Closure*, are more technically sound and only include projected performance enhancements (productivity improvements) that can be documented. Management-related data such as disposition maps, critical closure paths, and programmatic risk assignments have been incorporated to enhance the rigor, quality, and realism of the planning process. Such data will continue to be refined.

Stakeholder, Regulator, and Tribal Nation Involvement

EM received over 170 letters during the *Discussion Draft* comment period, containing comments on a broad range of subjects from stakeholders, regulators, and Tribal Nations. In addition, each site worked closely with regulators and interested stakeholders and Tribal Nations in the formulation of their own site projections. Most of these comments were supportive of the goals and strategies outlined in the national *Discussion Draft*. Many comments challenged the Environmental Management program to improve the approach, assumptions, and processes related to the development and implementation of the draft cleanup strategy .

In December 1997, EM issued a document entitled, *Preliminary Response to Comments on the Accelerating Cleanup: Focus on 2006, National Discussion Draft*. This document conveyed how EM planned to respond to comments of concern submitted by stakeholders, regulators, and Tribal Nations during the national Discussion Draft comment period, which ended on September 9, 1997. In keeping with EM's commitment to respond to the issues of concern expressed in the letters, many of those comments are addressed in *Paths to Closure*. In addition, each site has worked with regulators and interested stakeholders and Tribal Nations in the formulation of their own site draft documents.

Addressing Stakeholder, Regulator, and Tribal Nation Comments

Topic Areas of Comments Received on *Discussion Draft*	Addressed in Chapter...
Data Quality	6
Cost Estimates	2
End States / Long-Term Stewardship	3, 6, E
Enhanced Performance	4
Compliance	1, 4
Budget	1, 4
Integration and Intersite Planning	4
Innovative Technology	4
Prioritization	1, 4
Contingencies	2
Contracting Strategies / Privatization	4
Waste Management PEIS	3, E
Groundwater Contamination	6
Radioactive Source Recovery Program	6
Public Participation	6
Other Comments	6

A 60-day public comment period, ending May 1, 1998, will follow immediately upon the release of this draft of *Paths to Closure* and the companion site documents.[2] The process for stakeholder, regulator, and Tribal Nation participation in the cleanup strategy process is described in greater detail in Chapter 6 of this report. Appendix G provides detailed information with respect to submitting comments.

Comments received will be used in revising and preparing for publication the final version of the FY 1998 *Accelerating Cleanup: Paths to Closure*. It will be released to stakeholders, regulators, and Tribal Nations early this summer. The comment process is designed to give stakeholders, regulators, and Tribal Nations the opportunity to continue to participate meaningfully in the process. As these groups engage in helping to develop EM's long-term priorities and objectives, they will continue to help shape the entire Environmental Management program.

In addition to incorporating stakeholder, regulator, and Tribal Nation comments, the Environmental Management program will take three steps to improve future, annual versions of *Paths to Closure*. First, EM will improve the quality of data in and degree of consistency among site material and waste disposition flow charts. Second, EM will refine *Paths to Closure* to reflect FY 1998 appropriations and President Clinton's FY 1999 budget request to Congress. Finally, EM plans to perform sensitivity analyses to investigate the potential effects of various enhanced performance scenarios (productivity improvements) on life-cycle cost estimates and completion schedules in site baselines.

[2]Each of the 11 Operations/Field Offices (described in Chapter 1) through which EM manages its cleanup program will publish a more detailed, site-specific version of Paths to Closure.